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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/388,567	09/02/1999	HOWARD E. RHODES	303.593US1	4170

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EXAMINER

MITCHELL, JAMES M

ART UNIT PAPER NUMBER

2827

DATE MAILED: 05/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n No.

09/388,567

Applicant(s)

RHODES, HOWARD E.

Examiner

James M. Mitchell

Art Unit

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-- Th MAILING DATE of this communication app ars on the cov r sheet with th correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-17 and 23-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-17 and 23-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

~~Claim Rejections - 35 USC § 102~~

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 3-8, 11, 15-17, 23-30 and 48-54, 57-58 are rejected under 35 U.S.C. 102(e) as being anticipated by Huang et al. (US 6,069,066).

3. Huang (Fig 2A-F) discloses a conductive structure and interconnect comprising a trench having a depth and width, the depth being greater than a critical depth (via sum of bottom layers), a number of metal layers (208,210, 212; Fig 2C) above the trench (206); wherein at least one of the number of metal layers is fabricated from copper (Col. 2, Lines 39-41) having a thickness; wherein said width is greater than the critical width (via more than twice the sum of sidewalls, 208, 210); and each number of metal stacked layers is planarized by CMP (Col. 2, Lines 56-59); alternatively a narrow first trench (205) having a top and depth greater than a critical depth (via sum of thickness of 208) and a width less than a sidewall width of a first metal (210), and a wide second trench or depression (206) having a depth greater than a second critical depth and a width greater than twice the side wall width of the first metal (210) and less than twice a sidewall width of an Al second metal (212; Col. 2, Lines 50-55)) with the first and

second metal deposited on the first and the second trench and the second trench is planarized to the top of the first trench; said second trench with a second width greater than the width (assumed to be critical width) with one of the plurality of metal layers coupled to the metal layer (via layers stacked); such that the Al is inherently coupled to the copper (via layers stacked); wherein the second trench has a Ti/TiN barrier layer (Col. 2, Lines 46-48) and a copper layer that covers the barrier layer and therefore is over said barrier; wherein one of a plurality of metal layers forms highly reliable bond to gold wire (Col. 3, Lines 28-30); with a wide trench/ depression having a second depth equal to the narrow trench depth that is greater than the critical depth (greater than summation of barrier layers).

4. With respect to the product by process claim "the number of metal layers is determined by the width, or "the number of metal layers... is a function of the width and critical width," the prior art structure is the same as the claimed invention. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

5. In regards to the limitations that recite "capable of" for example "stack layers capable of defining a critical width," "layers is capable of being increased as the width increases," or "layers capable of forming... eutectic bond..." Huang's structure is

capable of performing these intended use limitations. Furthermore, it has been held that an element is "capable of" performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. In re Hutchinson, 69 USPQ 138 (CCPA 1946).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 14, 55, 56, 59 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang (US 6,069,066) in combination with Lin et al. (U.S. 6,551,916)

9. Huang discloses elements of paragraph 3 and further that one of the plurality of metal layers is bonded to highly conductive, gold wire ("line"; Col. 1, Lines 58-60) and

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planarized layers (Fig 2D) with a second trench with a width greater than the width, but does not appear to disclose a wire bond coupling a conductive material to at least one of the plurality of metal layer or that the aluminum layer is an alloy.

10. With respect to claims 14 and 56, aluminum alloy comprising Al-Cu or Al-Si-Cu or a Gold alloy are known materials. *That one of ordinary skill has known to use these materials for the alloy because* It would have been obvious to one of ordinary skill in the art at the time the invention was made to form an aluminum alloy pad or gold alloy wire *because* ~~since~~ *motivating* it has been held to be within the general skill of a worker in the art to select known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416 (1960).

11. With respect to the process limitation of "wire-bonded" in claim 60, the prior art structure is the same as the claimed invention. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

12. Claims 9, 10, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in combination with Yost et al. (US 5,444,018).

13. Huang discloses the elements stated in paragraph 3, but does not explicitly disclose that one of the number of metal stack layers couples a first logic device to a second logic device or in the alternative a first and second memory cell.

14. Yost utilizes either a first and second logic or memory cell coupled by an interconnect (Column 2, Line 20; Column 6, Lines 31-36).
15. It would have been obvious to one of ordinary skill in the art to incorporate the contact structure of Huang with the logic interconnect structure of Yost in order to provide a contact structure as required by Yost (Abstract).
16. Claim 31-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sun et al. (U.S. 6,245,380) in combination with Hsu (U.S. 6,174,804).
17. Sun discloses an interconnect comprising: a trench having a critical depth (left trench; depth greater than summation of barrier as defined by applicant Spec. p.8), a width, a refractory metal, Ti/TiN, barrier layer (208), and a metal layer (210a) over the barrier layer; and a second trench (Rt. trench) having a second width greater than the width and the second trench having a barrier layer (208), a copper layer (210) over the barrier layer, and an aluminum layer (214); wherein the aluminum layer is planarized by chemical mechanical polishing (Fig 3-4); including a trench.
18. Sun does not appear to show either a titanium or tantalum over the copper layer, a titanium or tantalum nitride over the titanium or tantalum layer and an aluminum alloy over the titanium or tantalum nitride.
19. However Hsu utilizes a titanium nitride layer over a titanium layer (222).
20. It would have been obvious to one of ordinary skill in the art to incorporate either a titanium or tantalum nitride over a titanium or tantalum layer in between the copper and aluminum layers of Sun, such that the aluminum is over either the titanium or

tantalum nitride layer in order to provide a glue layer that is planarized as required by Sun (212).

21. With regards to the aluminum pad being alloy comprising either Al-Cu or Al-Si-Cu, these materials are known materials, and it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the pad of Sun out of an aluminum alloy to provide a pad comprising aluminum as required by Sun, since it has been held to be within the general skill of a worker in the art to select known material on the basis of its suitability for the intended use as a matter of design choice. *In re Leshin*, 125 USPQ 416 (1960).

Response to Arguments

22. Applicant's arguments filed January 8, 2004 have been fully considered but they are moot in view of new rejections. In order to expedite prosecution, examiner has addressed arguments that may still be applicable.

23. In regards to the 102 (b) rejection, the previous office action contained a typographical error that has been corrected so that the prior art reflects that it is 102 (e) reference.

24. As for applicant's assertion that the standard in *In re Sang Su Lee* has not been established, examiner respectfully disagrees. Applicant's argument appears based on a claim that Yost provides a sufficient contact. Unfortunately, this premise is neither supported by *In re Sang Su Lee's* holding or even in its dictum. Furthermore a case dealing with the taking of general knowledge is not analogous to this situation. Examiner has set forth the motivation in the prior office action for combining the prior art. The

strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principles, that some advantage or expected beneficial result would have been produced by their combination. In re Sernaker, 702 F.2d 989, 994-95, 217 USPQ 1, 5-6 (Fed. Cir. 1983). In this case, the combination of the prior art provides the advantage of a contact.

25. As for applicant's claim that the prior art does not have a depth greater than the critical depth, examiner disagrees. It is believed that the rationale behind applicant's assertion is that Huang does not expressly recite a depth greater than the critical depth, however this is not the standard. Disclosures can also be found in the prior art's drawings. In this case, applicant in its original specification defined the critical depth to merely be the summation of barrier layer in a trench. The prior art shows a barrier layer that is greater than the summation of its barrier layers and therefore greater than the critical depth.

Conclusion

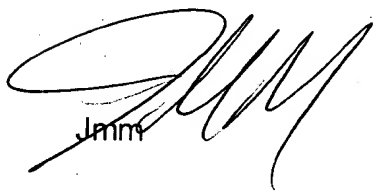
26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James M. Mitchell whose telephone number is (703) 305-0244. The examiner can normally be reached on M-F 9:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (703) 308-1233. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

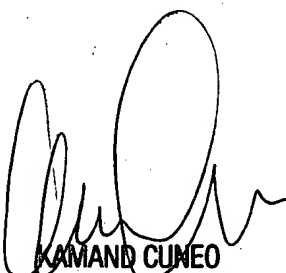
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Any inquiry of a general nature or relating to the status of this application or
proceeding should be directed to the receptionist whose telephone number is (703) 308-
0956.



Jimmy



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SUPERVISORY PATENT EXAMINER
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